

National Phase of PCT/DE2003/003375
Amdt. Dated April 8, 2005
Preliminary Amendment

Express Mail No. EV 609092955 US

Amendments to the Specification:

Please replace the Title with the following replacement Title:

~~COMMINUTION MACHINE FOR ALL KINDS OF MATERIAL, E.G. WASTE
OR WOOD~~ GRINDING MACHINE AND METHOD OF GRINDING
MATERIAL

Please add the cross-reference paragraph to the first page after the Title:

Cross-Reference to Related Application

This is the National Phase application of PCT/DE2003/003375 having an
international filing date of 9 October 2003 and which claims priority to German
application no. DE10247281.3 filed 10 October 2002, which are herein
incorporated by reference.

*Please replace the paragraph starting on page 1, line 4 with the following
replacement paragraph:*

Area Background of application of the invention

*Please replace the paragraph starting on page 1, line 6 with the following
replacement paragraph:*

The invention relates to a comminution grinding machine and method of grinding for all kinds of material, for example waste, such as domestic waste and bulky waste, or wood, comprising. The machines comprises a receiving element for the material, provided in a housing, at least one driven shaft, on which comminution-grinding tools are provided, and rigid cutting tools arranged in the housing as opposing tools for the comminution grinding tools for comminuting grinding the material.

Please delete the heading on page 1, line 15.

~~Prior art~~

Please replace the paragraph starting on page 1, line 17 with the following replacement paragraph:

Comminution or grinding machines of this type have been disclosed under the designation "Zerreißer" [shredders].

Please delete the paragraph starting on page 1, line 20.

~~Following an overall view of the prior art, an apparatus which has the groups of features described below may be assembled for the comminution machine outlined only generically at the start.~~

Please replace the paragraph starting on page 1, line 25 with the following replacement paragraph:

According to Current grinders such as those disclosed by EP 0 521 081 B1, as is known use the comminution tools that are formed by U-shaped knives, which are located in a plane at right angles to the axis of rotation for the shafts and which are arranged uniformly along and around two substantially parallel and horizontal shafts, which are. The shafts are driven by a motor which can drive the shafts in opposite directions, and which. Furthermore, the shafts have a mutual spacing which is somewhat greater than twice the spacing between the radial outer point of a knife and the axis of rotation. The drive apparatuses are provided between the motor and the shafts.

Please replace the paragraph starting on page 2, line 1 with the following replacement paragraph:

The material is fed to the knives through a shaft arranged above the knives. These knives interact with knives fixed in a stationary manner between the shafts on part of the frame of the apparatus for material comminution when the shafts rotate in opposite directions, which means that. In other words, the cutting edge of the blades is moved toward one another on the top side of the stationary knives.

Please replace the paragraph starting on page 2, line 14 with the following replacement paragraph:

~~The~~ As known in the art, drive devices comprise, likewise in a previously known way, a suitable gearbox for each of the two shafts, a hydraulic motor with adjustable rotational speed for driving each shaft, an adjustable pump for supplying each hydraulic motor and gearbox, by means of which the motor drives the pumps, ~~which~~. The pumps are able to reverse the flow through the hydraulic motors in order to rotate each shaft individually forward and backward in accordance with a predetermined sequence.

Please replace the paragraph starting on page 2, line 24 with the following replacement paragraph:

~~From the invention according to~~ As disclosed in EP 0 521 081 B1, it is possible to gather that it is important: for each knife to comprise two substantially U-shaped blades arranged one behind the other; for the radially outer and front parts of the two blades, seen in the direction of rotation of the cutting movement of the knives, to be constructed as substantially tangentially oriented wedges; for the spacing between the axis of rotation and the wedge of the front blade to be shorter than the spacing between the axis of rotation and the wedge of the following blade; and for the radially outer contour of the following blade to correspond substantially to a segment of a spiral line around the axis of rotation.

Please replace the paragraph starting on page 3, line 12 with the following replacement paragraph:

Furthermore, at least one rotatable shaft of a drive unit is provided in known manner, ~~which~~ wherein the shaft is arranged above the cutting table in a direction which extends at right angles to the lower knives.

Please replace the paragraph starting on page 3, line 17 with the following replacement paragraph:

Finally, as is known, there is are a number of disk-like upper knives, which are fixed to the shaft, ~~of which each~~ Each knife is provided with a number of teeth and ~~which~~ extends partially downward into each of their

openings in the table. Each opening is wider than the associated upper knife which, in addition, is arranged close to one of the lower knives in the associated opening.

Please replace the paragraph starting on page 3, line 26 with the following replacement paragraph:

~~According to the invention disclosed there~~ Accordingly, it is important that the lower knife extends in a direction which intersects the axis of the shaft or a region around the latter, ~~in relation to this design it being assumed that, according to DK 169 378, wherein~~ a cutting table whose plane already extends underneath the shaft is ~~already known as disclosed in DK 169,378.~~

Please replace the paragraph starting on page 3, line 34 with the following replacement paragraph:

~~In this case, on each side of the shaft there is arranged a set of a plurality of knives, whose arrangement in relation to one another form a V or an inverted V, wherein the respective cutting edges can be designed to be curved or wavy.~~

Please delete the paragraph starting on page 4, line 1:

~~The respective cutting edges can be designed to be curved or wavy.~~

Please replace the paragraph starting on page 4, line 4 with the following replacement paragraph:

~~By means of the constructional improvement according to As disclosed in EP 0 928 222 B1, of the cutting table is divided into knives, in which the plane of the cutting table intersects the axis of the shaft, the intention is for the material to be comminuted with an advantageous cutting angle of about 90°.~~

Please replace the paragraph starting on page 4, line 11 with the following replacement paragraph:

A comminution machine for materials, such as organic waste, bulky waste or the like, assembled in this way in accordance with the documented

prior art and described above, in spite of a tried and tested function, still exhibits disadvantages, ~~which consist in particular in the fact that such as:~~

- the stability of the comminution tools fitted to the shaft is endangered;
- the effectiveness of the comminution process is limited by the stationary knives;
- the throughput cannot be increased, because of the action of the shape of the comminution tools on the shaft, in interplay with the stationary knives, ~~forcing forces~~ material away; and
- the power consumption of the machine is relatively high.

Please replace the heading starting on page 4, line 29 with the following replacement heading:

Summary of the nub of the invention

Please replace the paragraph starting on page 4, line 31 with the following replacement paragraph:

The invention is ~~directed to~~ based on the object of providing a comminution a grinding machine and a method of grinding for all kinds of material, for example waste, such as domestic waste and bulky waste, or wood, ~~in particular organic waste, bulky waste, such as.~~ Such waste includes refrigerators, tires, furniture, carpets, mattresses, tree stumps, demolition timber or similar materials, which comprises. In an embodiment, the machine comprises:

- a receiving element for material, provided in a housing,
- at least one shaft, on which ~~comminution~~ grinding tools are arranged,
- rigid cutting tools which are fitted in the housing, whose cutting edges ~~in the extension just to do not extend to, but do not~~ intersect the axis of the shaft or a region around the axis, against which rigid cutting tools the ~~comminution~~ grinding tools of the shaft ~~comminute~~ grind the material put in.

Please replace the paragraph starting on page 5, line 12 with the following replacement paragraph:

Thus, in interplay between the ~~comminution~~ grinding tools acting in opposite directions of rotation with the rigid cutting tools, the waste is always taken in a differentiated manner, is conveyed and, fixed against the rigid cutting tools, is ~~comminuted~~ while being grinded with specifically low forces.

Please replace the paragraph starting on page 5, line 19 with the following replacement paragraph:

On one hand, the ~~comminution~~ grinding machine must be configured for production, operation, maintenance and repair in subassemblies suited for this purpose and, on the other hand, must be capable of control to the conditions of the ~~comminution~~ grinding process.

Please replace the paragraph starting on page 5, line 25 with the following replacement paragraph:

As a result of the ~~object to be achieved~~ invention,

- the stability of the ~~comminution~~ grinding tools of the shaft is to be increased,
- the level of ~~comminution~~ grinding is to be increased by means of constructional changes in the rigid cutting tools,
- the throughput of the machine is to be increased,
- the power consumption of the machine is to be reduced,
- the ability to ~~comminute~~ grind in particular ductile, non-brittle-fracture materials, such as plastic and plastic film, is to be promoted and
- the material present in the receiving area and to be ~~comminuted~~ grinded directly is to be fed completely to the available cutting geometries

~~and these objects are to be satisfied as advantages which act in their entirety as compared with the prior art.~~

Please replace the paragraph starting on page 6, line 9 with the following replacement paragraph:

~~According to the invention, this is achieved in that~~ In an embodiment,

- a) ~~the comminution~~ The grinding tools, seen respectively in a direction of rotation of the shaft and in their cross section, have at least two cutting regions, of which at least an inner cutting region is able to take and comminute more material to be comminuted and has a relatively short lever arm for this purpose, and also at least one outer cutting region is able to take and comminute less material to be comminuted and has a relatively long lever arm for this purpose, ~~the~~. The cutting contours of both cutting regions forming form a circular arc about the axis of the shaft in the direction of the axis of the shaft,
- b) ~~the~~ Further, the rigid cutting tools have a number of teeth arranged in a manner of a saw and thus two flanks of the teeth at an angle to each other interact with one of the cutting regions,
- c) ~~in~~ In each starting effective cutting position, a tip of the ~~comminution~~ grinding tools, forming a first transverse cutter, is oriented toward a tip of a tooth of the rigid cutting tools, forming a second transverse cutter, so as to be offset in parallel and cutting past, as a result of which ~~the~~, besides the cutting forces produced between the cutting regions of the ~~comminution~~ grinding tools and the cutting edges of the rigid cutting tools, an additional breaking edge, also arranged parallel to the axis of the shaft, with a parallel offset notching action on the material ~~and acting specifically highly~~ is obtained, ~~and~~,
- d) ~~the~~ Accordingly, the material is subjected to an active and additional ~~comminution~~ grinding process with the aggressive participation of the teeth of the rigid cutting tools.

Please replace the paragraph starting on page 7, line 8 with the following replacement paragraph:

~~In a further development aspect of the invention, the comminution~~ grinding tools are offset in relation to one another in the axial direction on the shaft or are arranged with a different radial spacing, ~~the~~. The teeth on the rigid cutting tools also ~~being~~ are arranged accordingly, ~~which~~ wherein ~~the~~ rigid cutting tools run as a slab, ~~as it is known~~.

Please replace the paragraph starting on page 7, line 15 with the following replacement paragraph:

Furthermore, the shaft has disks on which the comminution grinding tools are arranged or formed. These comminution grinding tools interact with the teeth, specifically intermeshing between the rigid cutting tools of the slab arranged at intervals.

Please replace the paragraph starting on page 7, line 21 with the following replacement paragraph:

In order to be able to install and dismantle the shaft in a beneficial way, it has journals on both sides which are detachably connected joined to the shaft and, if appropriate, form a bearing region. In this case, the joint can be configured such that it is made by means of a flange.

Please replace the paragraph starting on page 7, line 28 with the following replacement paragraph:

The housing is ~~of formed by~~ a double-walled design at the ends and, in between ~~these the ends and the housing~~, a disk is connected to the shaft and sealing ~~in the manner of a labyrinth seal to seal~~ against the emergence of material is provided which can expediently be formed by the flange.

Please replace the paragraph starting on page 8, line 1 with the following replacement paragraph:

~~In support of the advantages which result from the actions according to the invention, such as~~ Thus, the present invention provides for:

- increasing the level of comminution grinding,
- increasing the throughput and
- reducing the power consumption

~~in order to improve the efficiency of the comminution grinding machine, and for the further optimization of the comminution grinding process, use is also made of a controller which obtains its reference variables from at least one gradient of a parameter of the comminution grinding process.~~

Please replace the paragraphs on page 8, lines 16-38 with the following replacement paragraphs:

The invention will be explained in more detail below using an exemplary embodiment. In the drawings:

fig. Fig. 1 shows a longitudinally sectioned side view of the comminution grinding machine;

fig. Fig. 2 shows a plan view according to figure 1;

fig. Fig. 3 shows the cross section corresponding to figures Figs. 1 and 2 in a simplified representation of the features important to the invention of the phases of the active principle of the invention between the comminution grinding tools and the rigid cutting tools in the an operating phase of with the material put in the machine and not yet comminuted ground;

fig. Fig. 4 shows the cross section analogous to figure Fig. 3 in the a sequential operating phase of the started comminution grinding process; and

fig. Fig. 5 shows the cross section analogous to figures Figs. 3 and 4 in the another sequential operating phase of the further comminution grinding process.

Please replace the heading starting on page 9, line 1 with the following replacement heading:

~~Best way of implementing the invention~~ Description of the invention

Please replace the paragraph starting on page 9, line 7 with the following replacement paragraph:

A comminution grinding machine according to the present invention for domestic waste, bulky waste or wood, according to figures 1 and 2, comprises a housing 1 having two shafts 2 mounted therein and driven in opposite directions. Arranged Turning to Fig. 2, arranged on the shafts 2 are disks 2.1 which have comminution grinding tools 3. These comminution grinding tools 3 are lined up in a row at intervals from one another on the shafts 2 such that they operate offset in parallel in interaction with rigid cutting tools 4, which run

as a slab in the axial direction of the shafts 2, and commminate grind material 5 put in via a receiving element 1.2 in a cutting manner.

Please replace the paragraph starting on page 9, line 17 with the following replacement paragraph:

As compared with the known prior art, it is important for the technical requirement on the commminution grinding machine that imaginary extensions of the cutting edges 4.1 (figures 3 to 5) of the rigid cutting tools 4 do not intersect the axis of the shafts 2 or regions around the axis.

Please replace the paragraph starting on page 9 line 24 with the following replacement paragraph:

This requirement is aimed at the fact that, As such, in interplay of the commminution grinding tools 3 with the rigid cutting tools 4, the material 5 can be taken in a differentiated manner, conveyed and, fixed against the rigid cutting tools 4, commminated and grinded with specifically low forces. This means that Accordingly, the efficiency of the commminution grinding machine 10 with regard to the commminution grinding process is increased substantially as compared with the conventional shredders.

Please replace the paragraph starting on page 9, line 34 with the following replacement paragraph:

In accordance with figures Figs. 3 to 5, the commminution plurality of grinding tools 3, in each case seen in a direction of rotation of the shaft 2 and in their cross section, have two cutting regions 3.1, 3.2 which are configured such that the stability of the commminution plurality of grinding tools 3 is not endangered.

Please replace the paragraph starting on page 10, line 4 with the following replacement paragraph:

An The inner cutting region 3.1 takes more material 5 to be commminated grinded and acts with a relatively short lever arm, and a the outer cutting region 3.2 takes less material 5 to be commminated grinded and acts with a relatively long lever arm. In this case, the contours 3.3 of said the cutting regions 3.1, 3.2 in each case describe a concentric circular arc about the shaft 2 in the direction of the axes of the shafts 2.

Please replace the paragraph starting on page 10, line 13 with the following replacement paragraph:

~~Basically, with~~ With this design implementation, the preconditions are given for using the available forces more effectively than hitherto for the ~~comminution grinding~~ process of the respective material and in a more differentiated manner.

Please replace the paragraph starting on page 10, line 19 with the following replacement paragraph:

~~In a functional correspondence with this, the~~ The plurality of rigid cutting tools 4 have a plurality of teeth 4.2 arranged in the manner of a saw. Thus, two flanks 4.3 of the teeth 4.2 at an angle to each other interact with at least one of the cutting regions 3.1, 3.2 in such a way that the respective material 5 is always clamped in and is notched and cut comprehensively by the available edges of the cutters.

Please replace the paragraph starting on page 10, line 28 with the following replacement paragraph:

~~Added to this, and fusing functionally with this effect, is the fact that in each starting cutting position becoming effective a tip of the comminution tools 3, forming a respective first transverse cutter 3.4, is oriented~~ As shown in Fig. 3, a tip of each grinding tool 3 forms a first transverse cutter 3.4 which orients toward a tip of a tooth 4.2 of the rigid cutting tools 4, forming a respective second transverse cutter 4.4, so as to be offset in parallel and cutting past. As a result, besides the cutting forces produced and acting between the cutting regions 3.1 and 3.2 of the ~~comminution grinding~~ tools 3 and the cutting edges 4.1 of the rigid cutting tools 4, an additional breaking edge, also arranged parallel to the axis of the shaft 2, with a notching action offset parallel to the respective piece of material 5 and acting specifically highly is obtained.

Please replace the paragraph starting on page 11, line 6 with the following replacement paragraph:

~~This combination of features thus~~ As such, the present invention subjects the material 5 to an active and additional ~~comminution grinding~~

process with the aggressive participation of the teeth 4.2 of the rigid cutting tools 4.

Please replace the paragraph starting on page 11, line 11 with the following replacement paragraph:

Conclusively in relation to the increased requirements placed and to the object set in accordance with the invention, this comminution grinding machine is better suited to the types of material 5 outlined at the beginning in comminution practice, in that previously discussed such that:

- the stability of the comminution grinding tools 3 is increased,
- the level of comminution grinding and the throughput are increased,
- the power consumption is reduced

and, finally, the comminution grinding process of a "shredder" is supported.

Please replace the paragraph starting on page 11, line 26 with the following replacement paragraph:

The improved actions of the comminution During use, the actions of the grinding machine according to the invention can be gathered from figures Figs. 3 to 5 in three phases illustrated.

Please replace the paragraph starting on page 11, line 30 with the following replacement paragraph:

—According Referring to figure Fig. 3, the illustration shows schematically how the material 5 can be taken in different volumes by cutting regions 3.1, and 3.2 acting with different sized lever arms and can be distributed to the rigid cutting tools 4 between the two flanks 4.3 in such a way that the comminution grinding is prepared optimally.

Please replace the paragraph starting on page 11, line 37 with the following replacement paragraph:

—With Turning to figure Fig. 4, it becomes clear how, in a functional fusion, firstly of by the actions of the cutting regions 3.1, 3.2 against the cutting-edges 4.1, the material 5 clamped in the flanks 4.3 is cut and,

secondly, is subjected to the corresponding actions of the first transverse cutters 3.4 with the second transverse cutters 4.4 and the additional breaking edge effect.

Please replace the paragraph starting on page 12, line 7 with the following replacement paragraph:

Finally, figure Fig. 5 shows in particular the phase in which the outer cutting regions 3.2 having the long lever arm and the corresponding lesser amount of less taken material 5 act against the rigid cutting tools 4.

Please replace the paragraph starting on page 12, line 12 with the following replacement paragraph:

While maintaining the active principle according to the invention and assisting the matter further, according to figures 1 and 2, the combination grinding tools 3 are arranged offset radially from one another in the actual direction on the shafts 2. (Not shown) Not illustrated in the figures is the possibility that In another embodiment, the combination grinding tools 3 are arranged in a different angular position on the shafts 2, that is to say axially in the cutting profile, for example running conically. (Not Shown) The Accordingly, the teeth 4.2 of the rigid cutting tools 4 running axially as a slab also have to be arranged correspondingly as such.

Please replace the paragraph starting on page 12, line 24 with the following replacement paragraph:

The technologically beneficial implementation for the production, the operation, the maintenance and repair of the commminution grinding machine according to the invention is achieved with the features further illustrated in figure Fig. 1. For this purpose, shafts 2 have journals 2.2 with forming a bearing region at the ends wherein the journals 2.2 are detachably joined to the shaft 18. The joint between the journals 2.2 and the shafts 2 is made by means of flanges 2.3.

Please replace the paragraph starting on page 12, line 23 with the following replacement paragraph:

~~For operation in practice~~ In operation, in order to assist optimal ~~comminution grinding~~ and reliability of the ~~comminution grinding~~ machine, it is important that no material 5 penetrates through components to be sealed off from one another. Therefore, the housing 1 according to ~~figure~~ Fig. 1 is designed with a double wall 1.1 at the ends, in which the journals 2.2 or ends of the shaft 2 have a disk seal 2.4, which forms a sealing labyrinth with the double wall 1.1. ~~The~~ In an embodiment, the disk seal 2.4 is technologically advantageously formed by the flanges 2.3.

Please replace the paragraph starting on page 13, line 6 with the following replacement paragraph:

In order to protect the rigid cutting tools 4 against wear, it is beneficial, as indicated in figures Figs. 3 to 5, to equip the cutting contours 4.5 of the rigid cutting tools 4 with wearing elements 4.6.

Please delete the heading starting on page 13, line 11:

Commercial applicability

Please replace the paragraph starting on page 13, line 13 with the following replacement paragraph:

In all of the features claimed, a ~~comminution machine~~ grinding designed according to the invention is optimally able to meet the increased requirements on the ~~comminution grinding~~ of material of the types described by including, ~~for this purpose a means for controlling the grinding machine, wherein also being provided with which the a~~ gradient of a parameter of the ~~comminution grinding~~ machine is registered and used as a reference variable for the control of the ~~comminution grinding~~ machine.

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